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Effect of medium dielectric constant on the physical properties of single-walled carbon nanotubes

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Solvents	Relative dielectric constant (ε)	Refractive index (η)
cyclohexane	2.02	1.43
p-xylene	2.27	1.5
toluene	2.39	1.5
chlorobenzene	5.62	1.52
chloroform	4.81	1.45
o-Dichlorobenzene	10.12	1.55
tetrahydrofuran (THF)	7.5	1.41
dichloromethane	9.1	1.42

Table 1. Properties of the solvents in this study.

(7,5) tubes

Environment	A_1	τ_1	A_2	τ_2	τ_{eff}
Tol + CB	0.613 ± 0.0257	5.39 ± 0.385	0.829 ± 0.0165	30.8 ± 0.684	20.02
Tol + $CHCl_3$	0.862 ± 0.023	7.41 ± 0.409	0.538 ± 0.025	38.9 ± 2.47	19.5
Tol + CH_2C_{l2}	1.58 ± 0.0188	6.19 ± 0.155	0.170 ± 0.0202	31.5 ± 4.08	8.64
Tol + Cyclohexane	0.633 ± 0.0401	5.07 ± 0.455	0.828 ± 0.0163	35.3 ± 1.01	22.2
Tol + oDCB	0.692 ± 0.0319	5.03 ± 0.357	0.817 ± 0.0174	29.7 ± 0.681	18.4
Tol + THF	0.761 ± 0.0365	6.03 ± 0.561	0.593 ± 0.0446	26.4 ± 1.69	15.0
Tol	0.880 ± 0.0161	7.50 ± 0.324	0.649 ± 0.0169	40.9 ± 1.55	21.7
Tol + xylene	0.684 ± 0.0318	6.81 ± 0.652	0.704 ± 0.0363	34.1 ± 2.05	20.7

(7,6) tubes

Environment	A_1	τ_1	A_2	τ_2	τ_{eff}
Tol + CB	1.07 ± 0.042	4.1 ± 0.643	0.657 ± 0.086	28.1 ± 3.42	13.2
Tol + $CHCl_3$	1.17 ± 0.262	4.56 ± 0.96	0.663 ± 0.0558	29.8 ± 2.91	13.7
Tol + CH_2Cl_2	2.34 ± 0.149	3.25 ± 0.336	0.572 ± 0.126	11.6 ± 1.45	4.89
Tol + Cyclohexane	0.818 ± 0.076	4.82 ± 0.919	0.761 ± 0.0607	27.8 ± 3.91	15.9
Tol + oDCB	1.05 ± 0.043	6.18 ± 0.529	0.465 ± 0.0515	28.6 ± 2.94	13.1
Tol + THF	1.06 ± 0.0196	5.09 ± 0.178	0.634 ± 0.0179	22.7 ± 0.489	11.7
Tol	0.717 ± 0.0267	5.81 ± 0.386	0.748 ± 0.0186	33.4 ± 0.942	19.9
Tol + xylene	1.09 ± 0.0458	5.83 ± 0.454	0.571 ± 0.0368	30.4 ± 2.03	14.3

(8,6) tubes

Environment	A_1	τ_1	A_2	τ_2	τ_{eff}
Tol + CB	0.724 ± 0.0231	6.45 ±0.199	0.804 ± 0.0413	30.2 ± 0.785	18.9
Tol + $CHCl_3$	0.861 ± 0.039	5.95 ± 0.566	0.659 ± 0.0425	29.3 ± 1.85	16.1
Tol + CH_2Cl_2	1.65 ± 0.058	5.9 ± 1.12	0.203 ± 0.02	29.7 ± 2.22	8.51
Tol + Cyclohexane	0.818 ± 0.0902	6.92 ± 1.49	0.604 ± 0.0737	38.09 ± 6.13	20.2
Tol + oDCB	0.821 ± 0.0802	5.46 ± 1.08	0.637 ± 0.0922	26.2 ± 3.49	14.5
Tol + THF	0.901 ± 0.065	5.81 ± 0.517	0.645 ± 0.0164	28.8 ± 1.43	15.4
Tol	0.854 ± 0.596	6.99 ± 0.859	0.761 ±0.039	40.7 ± 2.85	22.9
Tol + xylene	0.823 ± 0.069	4.84 ± 1.37	0.785 ± 0.0155	28.9 ± 1.02	16.6

Table 2. Fit results of the PL decays of SWNTs.

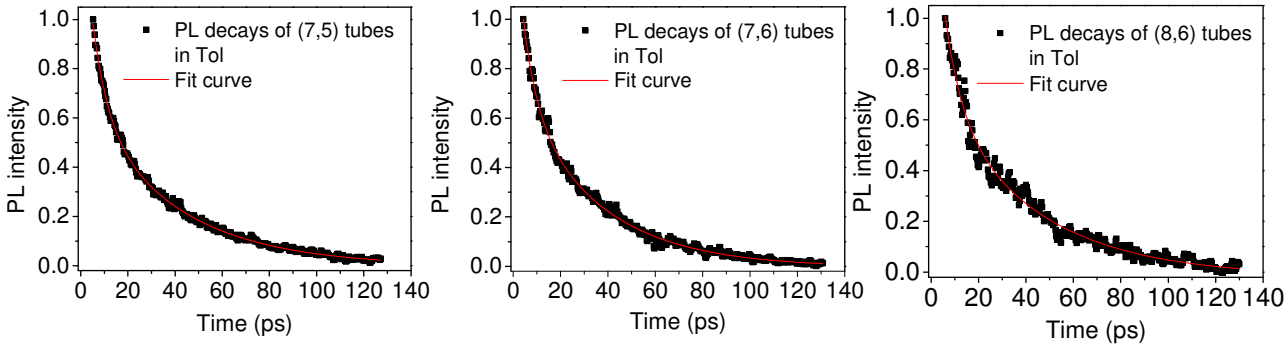

Fig 1. PL decays of SWNTs in toluene and fit results